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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,285	11/25/2003	**Rahul Shrivastav**	5853-278-1	9081

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EXAMINER	
SHAH, PARAS D	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/722,285	SHRIVASTAV, RAHUL	
	Examiner	Art Unit	
	PARAS SHAH	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 June 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-11,13-21 and 23-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-11,13-21 and 23-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Arguments and Amendments with RCE filed on 06/03/2009. Claims, 1, 3-11, 13-21, and 23-54 are pending and have been examined. The Applicant's arguments and amendments have been considered, but they do not place this case in condition for Allowance.

2. All previous objections and rejections directed to the Applicant's disclosure and claims not discussed in this Office Action have been withdrawn by the Examiner.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/04/2009 has been entered.

Response to Arguments

4. Applicant's arguments with respect to claims 1-30 have been considered but are not persuasive for the reasons cited in the Advisory Action. These reasons have been repeated below.

With respect to the Applicant's arguments with respect to claims 1, 11, and 21, arguments are made that Bayya fails to teach identifying one or more voice

quality attributes of said voice signal by analyzing processed voice signal and comparing said one or more voice quality attribute of said voice signal with one or more baseline voice quality attributes in order to determine at least one measure of the signal. The Examiner respectfully disagrees with this assertion. Bayya teaches a voice attribute. In Bayya, the voice attribute is the cepstral values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) that are used to determine the distortion of the signal (see col. 3, lines21-24 and col. 3-4. Further, Bayya uses the distorted speech and compares it to a set of reference vectors (baseline measure by using reference vectors). The comparison results in a voice quality measure.

The Applicants assert that such teachings are different then the claimed invention. The examiner disagrees with this assertion. As in the Applicant's Published Specification, in paragraph [0017], voice quality attributes includes measure of noise in a text voice signal. This is similar to Bayya's invention where the distorted voice (noisy) (see col. 4, lines 52-55, where the distortion helps calculate a score to determine the distortions with respect to background noise and naturalness). Hence, in Bayya, the attribute is representative of the cepstral values that will be used to determine the distortion. This distortion is representative of a noise and naturalness of the input speech. Further, the secondary reference of Treurniet teaches the processing of audio signal with an auditory model. The motivation for combining the two references was also provided, where in was indicated to better estimate the perception of the signal

as indicated in col. 2, lines 19-22. Further, Treurniet addresses the distortion of signal and directs the inventions towards measuring quality of speech in communication networks as disclosed in Bayya (see Treurniet, col. 2, lines 25-26 and lines 43-45). Hence, for these reasons the Applicant's arguments are not persuasive.

With respect to newly added claims 31-54, appropriate mapping for each limitation is found below. No new reference has been applied.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 11, 13-20, and 39-46 are rejected under 35 U.S.C. 101 because the claims appear to be directed to a software embodiment and not to a hardware embodiment, where a machine claim is directed towards a system, apparatus, or arrangement. The claim limitations to be directed towards a program as stated in the published application, paragraph [0036] of the Published Application, where it describes a software embodiment, namely, computer program that represents the auditory model, voice processor, and comparator, which are used to perform the functions stated in the claim. There is no physical hardware component in the claim that would direct the claims towards a hardware embodiment. Thus, the claims are directed towards non-statutory subject matter. The dependent claims fail to overcome the aforementioned rejection. Further, the claimed invention is to a "computer program" *per se* as recited in

the preamble and as such is non-statutory subject matter. See MPEP 2106.01 [R-5]. Data structures not claimed as embodied in computer readable media are descriptive material *per se* and are not statutory because they are not capable of causing functional change in the computer. See e.g., Warmerdam, 33 F.3d at 1361, 31, USPQ2d at 1760 (claim to a data structure *per se* held nonstatutory). Such claimed data structures do not define any structural and functional interrelationships between data and other claimed aspects of the invention, which permit the data structure's functionality to be realized. In contrast, a claimed computer readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory.

Claim Rejections - 35 USC § 103

7. **Claims 1, 11, 21, and 31-54** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771).

8. Regarding **claim 1**, BAYYA teaches a method of diagnosing voices comprising:

processing a voice signal ("receives an input corresponding to the corrupted speech signal", BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identifying one or more voice quality attributes of said voice signal by analyzing said processed voice signal ("generates corresponding signals 18 representing the

amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized", BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

comparing said one or more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of the voice signal (see BAYYA, columns 3-4, equations 1-6)

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches processing a voice signal using an auditory model to produce a processed voice signal ("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

9. Regarding **claim 11**, BAYYA teaches a system for diagnosing voices comprising:

process a voice signal voice signal ("receives an input corresponding to the corrupted speech signal", BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identify one or more voice quality attributes of said voice signal by analyzing said processed voice signal ("generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized", BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

compare said one or more voice quality attributes of the voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal quality attributes values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of said voice signal (see BAYYA, columns 3-4, equations 1-6)

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches process a voice signal using an auditory model to produce a processed signal ("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to

process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

10. Regarding **claim 21**, BAYYA teaches a machine readable storage, having stored thereon a computer program having a plurality of code sections executable by a machine for causing the machine to perform the steps of:

processing a voice signal ("receives an input corresponding to the corrupted speech signal", BAYYA, column 2, lines 49-50) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered);

identifying one or more attributes of said voice signal by analyzing said processed voice signal ("generates corresponding signals 18 representing the amount of distortion in the corrupted speech signal for each of the plurality of distortion measure utilized", BAYYA, column 3, lines 21-24 and col. 3-4, equations 1-6, power spectra, LPC, cepstral values are calculated in order to calculate distortion measure) (e.g. The speech signal corresponds to a speaker's voice from whom it was uttered, where attributes of the speech signal are identified);

comparing said one ore more voice quality attributes of said voice signal with one or more baseline vocal quality attributes derived from at least one baseline voice signal values (see col. 3, lines 1-8 and see equation 6 using these cepstral values to determine a distortion measure) in order to determine at least one measure of vocal quality of said voice signal (see BAYYA, columns 3-4, equations 1-6),

However, BAYYA does not disclose using an auditory model.

In the same field of field of quality measurement, TREURNIET teaches processing, via the computer (see col. 12, lines 28, implemented using a computer systems and see col. 3, lines 3-5, system is implemented in a computer), a voice signal using an auditory model to produce a processed voice signal ("peripheral ear processor 22 that processes signals according to a peripheral ear model", TREURNIET, column 4, lines 24-25).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the peripheral ear model of TREURNIET to process the input received by BAYYA in order to better estimate how the signal will be perceived (see TREURNIET, column 2, lines 19-22).

11. Regarding **claims 31, 39, and 47**, BAYYA further teaches recording a voice signal (see col. 2, lines 54, microphone receives corrupted speech); generating a voice signal based on the recording of the speaker's voice (see col. 2, lines 53-54, A/D converter).

12. Regarding **claims 32, 40, and 48**, BAYYA further teaches wherein the one or more baseline vocal quality attributes are derived from at least one baseline voice signal ("the speech reference vectors 16 are obtained from a large number of clean speech samples", BAYYA, column 2, lines 57-58) (e.g. The reference and the distorted speech are compared. The baseline vocal quality is derived from reference signal, which is based on various speech references (see col. 2, lines 57-60). Vocal quality evaluated in terms of distortion (see col. 5, lines 28-34)).

13. Regarding **claims 33, 41, and 49**, BAYYA further teaches wherein the one or more baseline vocal quality attributes are associated with at least one baseline measure of vocal quality of a human speaker (see col. 4, equation , where the cepstral coefficients are used in calculating a distortion measure between the input and reference).

14. Regarding **claims 34, 42, and 50**, BAYYA further teaches wherein the at least one objective measure of voice quality of the voice signal defines a degree of vocal quality of the voice signal ("value between 1 and 5", BAYYA, column 5, line 6) relative to the at least one baseline measure of vocal quality of a human speaker ("the speech reference vectors 16 are obtained from a large number of clean speech samples", BAYYA, column 2, lines 57-58 and see col. 2, lines).

15. Regarding **claims 35, 43, and 51,** BAYYA further teaches, wherein the at least one measure of voice quality is an objective measure of voice quality ("predicting the subjective scores corresponding to the quality of speech based on the objective measurements", BAYYA, column 4, lines 58-59).

16. Regarding **claims 36, 44, and 52**, TREURNIET further teaches, wherein the auditory model is a transfer function corresponding to a human auditory system (see col. 4, lines 49-52, the peripheral ear model considers transfer characteristics and see col. 5, lines 26-37, especially equation shows a transfer function).

17. Regarding **claims 37, 45, and 53**, TREURNIET wherein the auditory model is a transfer function corresponding to an outer portion and middle portion of a human ear (see col. 5, lines 28, models effect of the ear canal and middle ear), an excitation pattern elicited on a basilar membrane (see col. 5, lines 5-11, localized basilar energy representation), within a cochlea (see col. 5, lines 10-15, where the spectral energy is mapped to a pitch scale that is linear with respect to the properties of the inner ear and see col. 4, lines 8-12, where the energy propagates to inner ear in which the cochlea contains the basilar membrane), and transduction of the excitation pattern into neural activity in fibers of an auditory nerve (see col. 5, lines 20-25, where the basilar membrane representations are determined and see col. 4, lines 15-20, where the peripheral ear model is modeled to transducing to neural activity via hair cells and passed to the brain using the auditory nerve.).

18. Regarding **claims 38, 46, and 54**, BAYYA teaches transmitting the voice signal through a communication channel (see col. 5, lines 47-54, where the speech signal is corrupted when received through from channel impairments or noise) prior to processing the voice signal (see col. 5, lines 54-58, where the corrupted speech signal is then processed).

19. **Claims 3-5, 13-15, and 23-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771), and in further view of DEAL et al. ("Some Waveform and Spectral Features of Vowel Roughness").

20. Regarding **claim 3**, the combination of BAYYA in view of TREURNIET teaches all the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET do not disclose that the measure of voice quality is at least one of roughness and hoarseness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of

the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph).

21. Regarding **claim 4**, DEAL further teaches that the one or more voice quality attributes of said voice signal include changes in pitch over time and changes in loudness over time ("acoustic measures of period and amplitude variation", DEAL, p. 251, 4th paragraph).

22. Regarding **claim 5**, DEAL further teaches that the one or more voice quality attribute of said voice signal includes a measure of partial loudness ("acoustic measures of… spectral noise level", DEAL, p. 251, 4th paragraph).

23. Regarding **claim 13**, the combination of BAYYA in view of TREURNIET teaches all the claimed limitation of claim 11.

However, BAYYA in view of TREURNIET do not disclose that the measure of voice quality is at least one of roughness and hoarseness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see DEAL, p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph).

24. Regarding **claim 14**, DEAL further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include changes in pitch over time and changes in loudness over time ("acoustic measures of period and amplitude variation", DEAL, p. 251, 4th paragraph).

25. Regarding **claim 15**, DEAL further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness ("acoustic measures of… spectral noise level", DEAL, p. 251, 4th paragraph).

26. Regarding **claim 23**, the combination of BAYYA in view of TREURNIET teaches all the claimed limitation of claim 21.

However, BAYYA in view of TREURNIET do not disclose that the measure of voice quality is at least one of roughness and hoarseness.

In the same field of speech quality measurement, DEAL discloses a method of measuring vocal roughness. DEAL teaches a measure of voice quality that is at least one of roughness and hoarseness ("provide a quantitative acoustic index predictive of

perceived vowel roughness", DEAL, p. 251, 4th paragraph, where vowel roughness is associated with voice roughness and hoarseness, see p. 251, 2nd paragraph).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of DEAL as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement by determining vowel quality contained in a speech signal (see DEAL, page 250, last three lines of 1st paragraph).

27. Regarding **claim 24,** DEAL further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include changes in pitch over time and changes in loudness over time ("acoustic measures of period and amplitude variation", DEAL, p. 251, 4th paragraph).

28. Regarding **claim 25,** DEAL further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness ("acoustic measures of… spectral noise level", DEAL, p. 251, 4th paragraph).

29. **Claims 6-10, 16-20, and 26-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over BAYYA et al. (US 6,446,038) in view of TREURNIET et al. (Patent No.: US 7,164,771), and in further view of HILLENBRAND et al. ("Acoustic Correlates of Breathy Vocal Quality").

30. Regarding **claim 6**, the combination of BAYYA in view of TREURNIET teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness ("acoustic measures in predicting breathiness ratings", HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract)

31. Regarding **claim 7**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy ("aspiration noise is inherently weak in the low frequencies", HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

32. Regarding **claim 8**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy ("periodic component of the voice source is inherently weak in the mid and high frequencies", HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

33. Regarding **claim 9**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal ("measure of the… average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

34. Regarding **claim 10**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include a measure of noise in the test voice signal and a measure of partial loudness of the test voice signal ("measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

35. Regarding **claim 16**, the combination of BAYYA in view of TREURNIET teaches all of the claimed limitation of claim 11.

However, BAYYA in view of TREURNIET do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness (“acoustic measures in predicting breathiness ratings”, HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract)

36. Regarding **claim 17**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy (“aspiration noise is inherently weak in the low frequencies”, HILLENBRAND, p. 312, 2^{nd} paragraph, meaning the low frequencies contain a strong periodic component).

37. Regarding **claim 18**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently

weak in the mid and high frequencies", HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

38. Regarding **claim 19**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal ("measure of the… average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

39. Regarding **claim 20**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the test voice signal include a measure of noise in the test voice signal and a measure of partial loudness of the test voice signal ("measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

40. Regarding **claim 26**, the combination of BAYYA in view of TREURNIET teaches all of the claimed limitation of claim 1.

However, BAYYA in view of TREURNIET do not disclose that the measure of voice quality is breathiness.

In the same field of speech quality measurement, HILLENBRAND discloses a method of measuring vocal breathiness. HILLENBRAND teaches a measure of voice quality that is breathiness (“acoustic measures in predicting breathiness ratings”, HILLENBRAND, *abstract*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the measurement method of HILLENBRAND as one of the distortion measures of BAYYA in order to increase the versatility of the quality measurement and to include quality measurements that compare different speech signals with and without pathological conditions (see HILLENBRAND, page 311, Abstract).

41. Regarding **claim 27**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of low frequency periodic energy (“aspiration noise is inherently weak in the low frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the low frequencies contain a strong periodic component).

42. Regarding **claim 28**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of high frequency aperiodic energy (“periodic component of the voice source is inherently weak in the mid and high frequencies”, HILLENBRAND, p. 312, 2nd paragraph, meaning the mid and high frequencies contain a strong aperiodic component).

43. Regarding **claim 29**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attribute of the test voice signal includes a measure of partial loudness of a periodic signal portion of the test voice signal ("measure of the… average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

44. Regarding **claim 30**, HILLENBRAND further teaches that the one or more voice quality attributes voice quality attributes of the voice signal include a measure of noise in the voice signal and a measure of partial loudness of the voice signal ("measure of the average spectral energy at or above 4 kHz to the average energy below 4 kHz", HILLENBRAND, p. 315, 4th paragraph, where the high frequencies contain noise and the low frequencies contain a periodic signal, see HILLENBRAND, p. 312, 2nd paragraph).

Conclusion

45. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The NPL document by Kim et al. ("Auditory Processing of Speech Signals for Robust Speech Recognition in real-world noise environments") is cited to disclose an auditory model for robust speech recognition. Theide et al. ("A new perceptual quality

measure for bit rate reduced audio") is cited to disclose quality evaluation of perceptual audio codecs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to 3333 whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-THURS. 7:00a.m.-4:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Hudspeth can be reached on (571)272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Paras Shah/
Examiner, Art Unit 2626

/David R Hudspeth/
Supervisory Patent Examiner, Art Unit 2626

08/26/2009